

ADC TRANSFER FUNCTION PROVIDING IMPROVED DYNAMIC REGULATION IN A SWITCHED MODE POWER SUPPLY

ABSTRACT

5 A power supply comprises at least one power switch adapted to convey power
between input and output terminals of the power supply, and a digital controller adapted
to control operation of the at least one power switch responsive to an output
measurement of the power supply. The digital controller comprises an analog-to-digital
10 converter providing a digital error signal representing a voltage difference between the
output measurement and a reference value, a digital filter providing a digital control
output based on a sum of previous error signals and previous control outputs, an error
controller adapted to modify operation of the digital filter upon an error condition, and a
digital pulse width modulator providing a control signal to the power switch having a
15 pulse width corresponding to the digital control output. The analog-to-digital converter
further comprises a windowed flash analog-to-digital converter having a transfer
function defining a relationship between the voltage difference and corresponding digital
values. The transfer function provides a substantially linear region at a center of a
corresponding error window, including a first step size in the center of the error window
20 and at least one other step size in a peripheral region of the error window that is larger
than the first step size. The first step size and the other step sizes may each reflect a
linear relationship between the voltage difference and the corresponding digital values.
Alternatively, the first step size reflects a linear relationship between the voltage
difference and the corresponding digital values, and the other step sizes each reflect a
25 non-linear relationship between the voltage difference and the corresponding digital
values.